CLAIMS

What is claimed is:

1. A method of treating a subterranean formation penetrated by a well, the method comprising the steps of:

(a) forming a treatment fluid comprising:

1) water;

2) a water-soluble polysaccharide capable of increasing the viscosity of the water and present in a sufficient concentration to increase the viscosity of the water; and

3) a breaker comprising at least one member selected from the group consisting of a source of chlorite ions and a source of hypochlorite ions, wherein the breaker is present in a sufficient concentration to break the viscosity of the treatment fluid after introduction of the fluid into the subterranean formation;

(b) at any stage of forming the treatment fluid, adding a breaker moderator comprising at least one member selected from the group consisting of a source of magnesium ions and a source of calcium ions to provide a sufficient concentration of the breaker moderator to control the break rate of the fluid; and

(c) introducing the treatment fluid into the well and into contact with the formation.

2. A method of treating a subterranean formation penetrated by a well, the method comprising the steps of:

(a) forming a treatment fluid, comprising:

1) water;

2) a water-soluble polysaccharide and a crosslinking agent for the water-soluble polysaccharide, which are present in a sufficient concentration to effect crosslinking of the of the polysaccharide and increase the viscosity of the water;

3) a breaker comprising at least one member selected from the group consisting of a source of chlorite ions and a source of hypochlorite ions, wherein the breaker is present in a sufficient concentration to break the viscosity of the treatment fluid after introduction of the fluid into the subterranean formation; and

4) a breaker moderator comprising at least one member selected from the group consisting of a source of magnesium ions and a source of calcium ions, wherein the breaker moderator is present in a sufficient concentration to control the break rate of the fluid; and

(b) introducing the treatment fluid into the well and into contact with the formation.

3. The method of Claims 1 or 2, wherein the formation has a static temperature of 200°F and above.

4. The method of Claim 3, wherein the formation has a static temperature of up to 350°F.

5. The method of Claims 1 or 2, wherein the step of introducing the treatment fluid into the well and into contact with the formation is at a rate and pressure sufficient to fracture the formation.

6. The method of Claims 4, wherein the step of introducing the treatment fluid into the well and into contact with the formation is at a rate and pressure sufficient to fracture the formation.

7. The method of Claim 6, wherein the treatment fluid further comprises a proppant.

8. The method of Claim 4, wherein the treatment fluid is adapted to break within 1 to 24 hours after being introduced into the well and into contact with the formation.

9. The method of Claim 4, wherein the polysaccharide comprises at least one member selected from the group consisting of galactomannans, modified or derivatized galactomannans, and cellulose derivatives.

10. The method of Claims 4, wherein the polysaccharide comprises at least one member selected from the group consisting of guar, hydroxypropylguar, carboxymethylhydroxypropylguar, carboxymethylhydroxyethylcellulose, carboxymethylcellulose, and hydroxyethylcellulose grafted with vinylphosphonic acid.

11. The method of Claim 2, wherein the crosslinking agent comprises at least one member selected from the group consisting of borate-releasing compounds, a source of titanium ions, a source of zirconium ions, a source of antimony ions, and a source of aluminum ions.

12. The method of Claim 11, wherein the borate releasing compound comprises ulexite.

13. The method of Claims 1 or 2, wherein the breaker comprises at least one member selected from the group consisting of alkali metal chlorites.

14. The method of Claim 6, wherein the breaker comprises at least one member selected from the group consisting of alkali metal chlorites.

15. The method of Claim 14, wherein the breaker comprises sodium chlorite.

16. The method of Claims 1 or 2, wherein the breaker moderator comprises at least one member selected from the group consisting of a source of magnesium ions.

17. The method of Claim 6, wherein the breaker moderator comprises at least one member selected from the group consisting of a source of magnesium ions.

18. The method of Claim 14, wherein the breaker moderator comprises at least one member selected from the group consisting of a source of magnesium ions.

19. The method of Claim 18, wherein the breaker moderator comprises at least one member selected from the group consisting of magnesium chloride, magnesium acetate, and magnesium sulfate.

20. The method of Claims 1 or 2, wherein the breaker moderator comprises at least one member selected from the group consisting of: calcium chloride, calcium acetate, and calcium nitrate.

21. The method of Claim 14, wherein the breaker moderator comprises at least one member selected from the group consisting of: calcium chloride, calcium acetate, and calcium nitrate.

22. The method of Claims 1 or 2, wherein the fluid further comprises a pH adjusting agent present in a sufficient concentration to adjust the pH of the fluid to be at least 10.

23. The method of Claim 14, wherein the fluid further comprises a pH adjusting agent present in a sufficient concentration to adjust the pH of the fluid to be at least 10.

24. A treatment fluid for treating a subterranean formation penetrated by a well, the fluid comprising:

(a) water;

(b) a water-soluble polysaccharide capable of increasing the viscosity of the water and present in a sufficient concentration to increase the viscosity of the water;

(c) a breaker comprising at least one member selected from the group consisting of a source of chlorite ions and a source of hypochlorite ions, wherein the breaker is present in a sufficient concentration to break the treatment fluid after introduction of the fluid into the subterranean formation; and

(d) a breaker moderator comprising at least one member selected from the group consisting of a source of magnesium ions and a source of calcium ions, wherein the breaker moderator is present in a sufficient concentration to control the break rate of the fluid, and wherein at least part of the concentration of the breaker moderator is added to the fluid.

25. A treatment fluid for treating a subterranean formation penetrated by a well, the fluid comprising:

(a) water;

(b) a water-soluble polysaccharide and a crosslinking agent for the water-soluble polysaccharide, which are present in a sufficient concentration to effect crosslinking of the of the polysaccharide and increase the viscosity of the water;

(c) a breaker comprising at least one member selected from the group consisting of a source of chlorite ions and a source of hypochlorite ions, wherein the breaker is present in a sufficient concentration to break the viscosity of the treatment fluid after introduction of the fluid into the subterranean formation; and

(d) a breaker moderator comprising at least one member selected from the group consisting of a source of magnesium ions and a source of calcium ions, wherein the breaker moderator is present in a sufficient concentration to control the break rate of the fluid, and wherein at least part of the concentration of the breaker moderator is added to the fluid.

26. The treatment fluid of Claims 24 or 25, wherein the treatment fluid breaks within 6 to 24 hours for at least one temperature in the range of 200°F to 350°F.

27. The treatment fluid of Claim 26, wherein the treatment fluid further comprises a proppant.

28. The treatment fluid of Claim 26, wherein the polysaccharide comprises at least one member selected from the group consisting of galactomannans, modified or derivatized galactomannans, and cellulose derivatives.

29. The treatment fluid of Claim 26, wherein the polysaccharide comprises at least one member selected from the group consisting of guar, hydroxypropylguar, carboxymethylhydroxypropylguar, carboxymethylhydroxyethylcellulose, carboxymethylcellulose, and hydroxyethylcellulose grafted with vinyl phosphonic acid.

30. The treatment fluid of Claim 26, wherein the crosslinking agent comprises at least one member selected from the group consisting of borate-releasing compounds, a source of titanium ions, a source of zirconium ions, a source of antimony ions, and a source of aluminum ions.

31. The treatment fluid of Claims 30, wherein the borate releasing compound comprises ulexite.

32. The treatment fluid of Claims 24 or 25, wherein the breaker comprises at least one member selected from the group consisting of alkali metal chlorites.

33. The treatment fluid of Claim 26, wherein the breaker comprises at least one member selected from the group consisting of alkali metal chlorites.

34. The treatment fluid of Claim 33, wherein the breaker comprises sodium chlorite.

35. The treatment fluid of Claims 24 or 25, wherein the breaker moderator comprises at least one member selected from the group consisting of a source of magnesium ions.

36. The treatment fluid of Claim 33, wherein the breaker moderator comprises at least one member selected from the group consisting of a source of magnesium ions.

37. The treatment fluid of Claim 24 or 25, wherein the breaker moderator comprises at least one member selected from the group consisting of magnesium chloride, magnesium acetate, and magnesium sulfate.

38. The treatment fluid of Claim 26, wherein the breaker moderator comprises at least one member selected from the group consisting of magnesium chloride, magnesium acetate, and magnesium sulfate.

39. The treatment fluid of Claim 24 or 25, wherein the breaker moderator comprises at least one member selected from the group consisting of: calcium chloride, calcium acetate, and calcium nitrate.

40. The treatment fluid of Claim 33, wherein the breaker moderator comprises at least one member selected from the group consisting of: calcium chloride, calcium acetate, and calcium nitrate.

41. The treatment fluid of Claims 24 or 25, wherein the fluid further comprises a pH adjusting agent present in a sufficient concentration to adjust the pH of the fluid to be at least 10.

42. The treatment fluid of Claim 33, wherein the fluid further comprises a pH adjusting agent present in a sufficient concentration to adjust the pH of the fluid to be at least 10.

43. The treatment fluid of Claims 24 or 25, wherein part of the concentration of the breaker moderator is naturally occurring in the water.

44. The treatment fluid of Claims 24 or 25, wherein the concentration of the breaker moderator is at least about 15 mg/L.

45. A method of treating a subterranean formation penetrated by a well, the method comprising the steps of:

(a) forming a treatment fluid comprising:

1) water,

2) a water-soluble polysaccharide capable of increasing the viscosity of the water and present in a sufficient concentration to increase the viscosity of the water; and

3) a breaker comprising at least one member selected from the group consisting of a source of chlorite ions and a source of hypochlorite ions, wherein the breaker is present in a sufficient concentration to break the viscosity of the treatment fluid after introduction of the fluid into the subterranean formation;

(b) selecting the water for naturally including a breaker modifier comprising at least one member selected from the group consisting of a source of magnesium ions and a source of calcium ions, where the breaker modifier is present in a sufficient concentration to control the break rate of the treatment fluid; and

(c) introducing the treatment fluid into the well and into contact with the formation.

46. A method of treating a subterranean formation penetrated by a well, the method comprising the steps of:

(a) forming a treatment fluid comprising:

1) water;

2) a water-soluble polysaccharide capable of increasing the viscosity of the water and present in a sufficient concentration to increase the viscosity of the water; and

3) a breaker comprising at least one member selected from the group consisting of a source of chlorite ions and a source of hypochlorite ions, wherein the breaker is present in a sufficient concentration to break the viscosity of the treatment fluid after introduction of the fluid into the subterranean formation;

(b) at any stage of forming the treatment fluid, adding at least one member selected from the group consisting of a source of magnesium ions and a source of calcium ions to provide at total ionic concentration of at least about 15 mg/L; and

(c) introducing the treatment fluid into the well and into contact with the formation.